

August 4, 2016

EX PARTE NOTICE VIA ECFS

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, S.W.
Room TW-A325
Washington, D.C. 20554

Re: ET Docket No. 15-26, Amendments of Parts 1, 2, 15, 90, and 95 of the Commission's Rules to Permit Radar Services in the 76-81 GHz Band
ET Docket No. 11-90, Amendment of Sections 15.35 and 15.253 of the Commission's Rules Regarding Operation of Radar Systems in the 76-77 GHz Band
ET Docket No. 10-28, Amendment of Section 15.253 of the Commission's Rules to Permit Fixed Use of Radar in the 76-77 GHz Band
WT Docket No. 11-202, Amendment of the Commission's Rules to Permit Radiolocation Operations in the 78-81 GHz Band

Dear Ms. Dortch:

Mercedes-Benz USA, LLC ("MBUSA"),¹ submits this letter in the above-captioned dockets regarding the Commission's proposal to permit vehicular radar operations in the 76-81 GHz band.² Specifically, MBUSA opposes the Commission's proposal to permit new fixed infrastructure radar or other new non-vehicular radar applications to operate in the 76-81 GHz band.

MBUSA continues to have grave concerns that new fixed infrastructure radar operations in the 76-81 GHz band (*i.e.*, fixed radar applications that have not been previously evaluated by the Commission for compatibility with vehicular radar) could cause harmful interference to current comfort and critical safety-related vehicular radar operations in the 76-81 GHz band. Automated driving will entirely depend on the unimpaired operation and reliability of high-resolution short-range radars in the band from 77-81 GHz. Allowing incompatible applications in that frequency band, which has been globally allocated on a primary basis to the radiolocation service to support automotive short-range high-resolution radar systems, would endanger the future of automated driving applications.³ The FCC should therefore promptly allow for the primary status licensing-by-

¹ Mercedes-Benz USA, LLC is a subsidiary and the registered agent of Daimler Aktiengesellschaft.

² Amendment of Parts 1, 2, 15, 90 and 95 of the Commission's Rules to Permit Radar Service in the 76-81 GHz Band, *Notice of Proposed Rulemaking and Reconsideration Order*, 30 FCC Rcd 1625 (2015).

³ See World Radiocommunication Conference, Resolution 654: Allocation of the Band 77.5-78 to the Radiolocation Service to Support Automotive Short-Range High-Resolution Radar Operations,

rule of vehicular radar use under Part 95 of the Commission's rules in the band from 76-81 GHz. The FCC should also reserve the band from 77-81 GHz for use by automotive high-resolution short-range radar applications.

The FCC should only allow in the 76-77 GHz band those fixed radar applications that have been clearly described, studied and proven to be able to share the band with incumbent primary or secondary services without causing interference. Sharing must be premised on the basis that interference between fixed radar applications and any incumbent service has to be avoided to the greatest extent possible. Sharing should not be derived from or depend on any resilience built into the incumbent systems. Only then should the FCC allow any particular new fixed radar application to operate in 76-77 GHz frequencies on an unlicensed basis under Part 15 of the Commission's rules, or on a site-licensed, secondary basis under Part 90 of the FCC's rules.

Proponents of allowing ubiquitous deployment of new fixed infrastructure radar systems in the 76-81 GHz band incorrectly argue that fixed radar systems will not cause interference to vehicular radar systems because "radiolocation applications using technologies that are similar to those used in vehicular applications are entirely consistent with the existing and anticipated use of the band..."⁴ Trex, for example, asserts that "vehicular radar is already designed to accommodate multiple cars in the same location," and that therefore "[t]he potential addition of non-automotive devices, including contention technologies, that use the same technological platform as vehicular radar devices, will be consistent with how vehicles already co-exist with each other."⁵ Trex argues further that "[t]he burden is already on radar manufacturers to devise extremely interference-tolerant system architectures," and that "[i]t is entirely reasonable to expect then that well-coordinated non-automotive radars using the same technology could easily coexist without any adverse impact on automotive radar operations."⁶

It should be noted that vehicular radars have been allocated in the band from 76-77 GHz for many years. During that time, they have been thoroughly studied and compared to other services in the 76-81 GHz band. On this basis, the ITU World Radio Conference in 2015 granted a primary allocation to the radiolocation service to support automotive short-range high-resolution radars.⁷

Regarding fixed radar applications in the band, the FCC has authorized only two fixed radar applications in the 76-77 GHz band that were found, after examination, to not create the potential for interference to vehicular radar. For example, the FCC has licensed 76-77 GHz Foreign Object and

(2012) ("WRC Resolution 654"), https://www.itu.int/dms_pub/itu-r/oth/0c/0a/R0C0A00000A0023PDFE.pdf.

⁴ Letter from Thomas Cohen, Counsel to Trex Enterprises Corp. to Marlene H. Dortch, Secretary, Federal Communications Commission, ET Docket No. 15-26, *et al.*, at 2 (Feb. 23, 2016) ("Trex Feb. 23 Ex Parte").

⁵ *Id.* at 3.

⁶ *Id.* at 5.

⁷ See 2015 World Radio Conference Agenda, Item 1.18 (2012), *available at* http://www.itu.int/dms_pub/itu-r/oth/12/01/R12010000014A01PDFE.pdf; WRC Resolution 654.

Debris (“FOD”) Detection radars on a site-by-site basis under Part 90 of the Commission’s rules,⁸ noting that “limiting the location of fixed radars [to airport locations] should prevent them from illuminating public roads, and thus reduce the likelihood of interference to vehicular radars while enabling airports to better monitor airport service vehicles and taxiways and to improve debris detection on the runways.”⁹ The FCC has also permitted the unlicensed operation of 76-77 GHz tank level probing radars (devices which are certain to be operated inside tanks and away from vehicles) under Part 15 of the Commission’s rules.¹⁰ The Commission found that level probing radar can “co-exist successfully with vehicular radars because the [level probing radar] is installed in a downward-looking position at fixed locations and the main-beam emission limits have been carefully calculated to avoid harmful interference to other radio services.”¹¹ Additionally, the “extreme propagation losses of radio signals at these frequencies would mitigate any potential harmful interference beyond a very short distance from the [level probing radar] device.”¹² No other fixed radar applications should be allowed in the band without a similarly thorough and particularized review of their potential impact on vehicular radars.

None of the existing or anticipated fixed radar applications are radiolocation services. Fixed radars are a family of applications with potentially very heterogeneous detection tasks and thus a wide range of signal designs. Trex describes a wide array of potential new 76-81 GHz fixed radar applications and urges the Commission to authorize all of these new applications now without being given a clear understanding of the technical operating parameters of such systems or the scenarios in which they would be used.¹³ Trex also envisions fixed radar systems with a much larger detection range, and thus more transmit power, and which occupy much more bandwidth than previously

⁸ See *Amendment of the Commission’s Rules to Permit Radiolocation Operations in the 78-81 GHz Band*, Report and Order, 28 FCC Rcd 10423 (2013).

⁹ *Amendment of Sections 15.35 and 15.253 of the Commission’s Rules Regarding Operation of Radar Systems in the 76-77 GHz Band*, Report and Order, 27 FCC Rcd 7888, ¶ 24 (2012).

¹⁰ See *Amendment of Part 15 of the Commission’s Rules To Establish Regulations for Tank Level Probing Radars in the Frequency Band 77-81 GHz*, Report and Order and Order, 29 FCC Rcd 761 (2014) (“LPR R&O”); See *Amendment of Part 15 of the Commission’s Rules to Establish Regulations for Tank Level Probing Radars in the Frequency Band 77-81 GHz*, Further Notice of Proposed Rule Making, 27 FCC Rcd 3660 (2012); see also *Amendment of Part 15 of the Commission’s Rules to Establish Regulations for Tank Level Probing Radars in the Frequency Band 77-81 GHz*, Notice of Proposed Rule Making and Order, 25 FCC Rcd 601 (2010).

¹¹ LPR R&O, 29 FCC Rcd at 774-75.

¹² *Id.*

¹³ Letter from Thomas Cohen, Counsel to Trex Enterprises Corporation to Marlene H. Dortch, Secretary, Federal Communications Commission, ET Docket No. 15-26, *et al.*, at 1 (Feb. 16, 2016) (“[Trex] plans to integrate multiple transceivers with processing electronics to put an entire MIMO radar on a single piece of silicon, which should lower the cost of radar electronics to approximately \$10... [which] will enable a vast array of new applications for millimeter wave (‘MMW’) radar, and the Commission should account for this potential in the rules it adopts in this proceeding.”).

considered fixed radar systems.¹⁴ These signal characteristics would be especially harmful to high-resolution short-range vehicular radars, which need unimpeded access to large swaths of spectrum in order to operate reliably, as intended.

Granting primary or co-primary licensed status to new fixed radar applications that have not been described or studied would be unprecedented and have severe negative consequences for the development of automated driving. Indeed, the Commission should only allow such applications in the band from 76-77 GHz on a subordinate basis under Part 15 if they have been clearly described, thoroughly studied and it is proven that they can share the band without causing harmful interference to incumbent systems.

From what is known about proposed new fixed infrastructure radar applications, such applications are neither built on the same technological platforms as vehicular radars, nor similar to vehicular radars. Instead, they are likely to cause interference to vehicular radar operations in the 76-81 GHz band. Fixed radar proponents anticipate a potentially heterogeneous mix of fixed radar applications with a wide range of functions and signal characteristics.¹⁵ MBUSA is aware of three existing fixed radar applications. As discussed above, the first two, Tank Level Probing and Foreign Object Debris Detection radars, do not threaten vehicular radar systems because they are limited to airfields or the interiors of tanks. The third is Navtech's fixed traffic infrastructure radar application, which has been shown to interfere with vehicular radar systems.¹⁶ Navtech's radar system is the only fixed radar application that is being assessed for compatibility in the pending 76-77 GHz European compatibility study, and therefore is the only proposed new fixed radar application for which detailed technical characteristics are known.¹⁷ It transmits in 360 degrees; is continuously sending and receiving a signal even when the beam is not pointing at its target; does not use a duty cycle; uses a comparatively high transmit power; occupies a very wide bandwidth and is only interrupted in time due to its rotation.¹⁸ Combined, these technical characteristics increase significantly the chances that it will cause interference to vehicular radar systems. However, because Navtech's system is designed for traffic monitoring, it is intended to be deployed in a vehicular environment and therefore should have also been designed to limit potential interference to the greatest extent possible.

Trex over-estimates the potential for vehicular radar-to-vehicular radar interference and understates the potential for fixed infrastructure radar to cause interference to vehicular radar.

¹⁴ Trex Feb. 23 Ex Parte at 4 ("The 5 GHz of contiguous bandwidth permits higher degrees of range separation and object discrimination than any lower frequency band... The 76-81 GHz band also is superior to the 57-64 GHz (Part 15) band in certain critical applications, including i) applications at a range beyond 1 km...").

¹⁵ *Id.*

¹⁶ See Letter from Ari Q. Fitzgerald, Counsel to MBUSA, to Marlene H. Dortch, Secretary, Federal Communications Commission, ET Docket No. 15-26, *et al.*, Attachment at 10-12 (July 15, 2016) ("MBUSA July 15 Ex Parte"); The Former SARA Group Comments at 12-13.

¹⁷ MBUSA July 15 Ex Parte, Attachment at 10-12.

¹⁸ *Id.*

Manufacturers design vehicular radar systems to avoid interfering with other vehicular radar systems when operating on the same frequencies. Interference between two vehicular radars can only occur in the unlikely event of an overlap in the frequency and time domains of both signals during their detection periods and a geometrical orientation with the victim vehicle in the field of view of the interfering vehicle.¹⁹ On a typical three-lane highway, there will be only one vehicle in front, one vehicle behind and possibly two vehicles on either side. Any single vehicle that is a potential interference victim in a natural driving scenario will only be surrounded by a few other vehicles. The radar signals of other vehicles that are further away will likely be obstructed or shadowed by those vehicles in close proximity to the interference victim vehicle. Thus, the risk of one vehicular radar system causing interference to another is very low. By contrast, a vehicular radar system that passes by a potential non-rotating fixed radar system will not be able to avoid interference that is caused by an overlap in both the frequency and time domains.²⁰

Vehicular radar manufacturers can only reliably design radar systems to mitigate known signal patterns that may cause harmful interference.²¹ They cannot reliably mitigate interference from the new fixed radar systems described by Trex because the technical characteristics of those systems are largely unknown. Furthermore, legacy vehicular radar systems that have been deployed over the last 15 years cannot be updated with any technology to avoid or tolerate these new signals and would therefore suffer from the propagation of any new fixed radar application that is not compatible. Moreover, the signal patterns of vehicular and fixed radar are different.²² Therefore, the fact that vehicular radar systems have been designed to coexist with each other does not mean that these same coexistence techniques will ensure that vehicular radar systems and fixed infrastructure radar systems can coexist.²³ Most importantly, the protection of vehicular radar systems, as well as of any other application with a primary or secondary allocation in the 76-81 GHz band, must not be derived from or depend on resilience built into those incumbent systems but must instead be guaranteed by the technology and signal design of the subordinate new fixed radar applications.

¹⁹ MBUSA July 15 Ex Parte at 11-15.

²⁰ *Id.*

²¹ Vehicular radar systems use spectrum very efficiently by limiting their spectrum use in time, space, occupied bandwidth, energy output and polarization. Manufacturers carefully engineer vehicular radar systems to avoid interference and tolerate interference from other vehicular radars to a reasonable extent. Strategies to tolerate interference consume valuable processing capacity and are therefore an inferior interference mitigation option compared to requiring new applications to demonstrate their compatibility with vehicular radar. To counteract the proliferation of vehicular radars, vehicular radar manufacturers implement a number of new measures to mitigate interference with each new generation of vehicular radars. The latest generation of vehicular radars is more resilient to interference from known sources, particularly from other vehicular sources, than legacy vehicular radar systems. Legacy vehicular radar systems already on the market cannot be updated to be resilient against new and unknown signal patterns. See MBUSA July 15 Ex Parte, Attachment at 7-8.

²² *Id.*

²³ *Id.*

The viability of future vehicular radar systems will depend on manufacturers' ability to rely on a globally harmonized regulatory regime. Vehicular radars have been described and studied for many years and were proven to be compatible with existing authorized services in the 76-81 GHz band before the ITU granted vehicular radars a primary allocation.²⁴ The ITU granted vehicular radars a primary allocation to create a continuous globally harmonized band to protect short-range vehicular radar and facilitate automated driving and promote the efficient use of spectrum.²⁵ The FCC should reject fixed radar proponents' calls to broadly authorize untested fixed radar systems that pose a very real risk of harmful interference to vehicular radar and instead require that any proposed new fixed radar applications be thoroughly described and tested (and ultimately shown to not cause interference to vehicular radar) before being permitted. If a fixed radar system meets these conditions, the FCC could then allow such system to operate on a subordinate, unlicensed basis in the 76-77 GHz band under Part 15 of the FCC's rules, or on a secondary, site-licensed basis under Part 90 of the FCC's rules. Regardless of the FCC's approach, subordinate fixed radar applications must guarantee the protection of 76-81 GHz vehicular radar systems. Such protection should not depend on the resilience of the vehicular radar systems.

For the same reasons cited by the Alliance of Automobile Manufacturers, the Association of Global Automakers and the Former SARA Group, MBUSA reiterates its request that the FCC continue to allow new 24 GHz wideband and UWB vehicular radar equipment authorizations until at least 2022 and allow in perpetuity the manufacture, marketing, sale, installation and operation of 24 GHz wideband and UWB vehicular radar equipment that is consistent with existing FCC equipment authorizations.²⁶

Pursuant to Section 1.1206(b)(1) of the Commission's rules, I am submitting a copy of this letter into the proceeding record.

Sincerely,

/s/ Ari Q. Fitzgerald

Ari Q. Fitzgerald
Counsel to Mercedes-Benz USA, LLC

²⁴ See The Former SARA Group Comments at 7; ITU-R, Recommendation M.1452, Millimeter Wave Vehicle Collision Avoidance Radars and Radiocommunication Systems for Intelligent Transport System Applications (2012), http://www.itu.int/dms_pubrec/itu-r/rec/m/R-REC-M.1452-2-201205-!!!PDF-E.pdf; ITU-R, Recommendation M.2057, Systems Characteristics of Automotive Radars Operating in the Frequency Band 76-81 GHz for Intelligent Transport Systems Applications (2014), http://www.itu.int/dms_pubrec/itu-r/rec/m/R-REC-M.2057-0-201402-!!!PDF-E.pdf.

²⁵ *Id.*

²⁶ See MBUSA July 15 Ex Parte, Attachment at 3; Letter from Ari Q. Fitzgerald, Counsel to the Alliance of Automobile Manufacturers, to Marlene H. Dortch, Secretary, Federal Communications Commission, ET Docket No. 15-26, *et al.*, at 1-2 (Jul. 22, 2016); The Former SARA Group Comments at 9-12.

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